

Notice of Allowability

Application No.

10/632,882

Examiner

Rodney G. McDonald

Applicant(s)

GOPALRAJA ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed 2-28-07.
2. ☒ The allowed claim(s) is/are 1-45.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date 3/15/07, 3/22/07
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

RODNEY G. MCDONALD
PRIMARY EXAMINER

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance:

Claims 1-23 are allowable over the prior art of record because the prior art of record does not teach the claimed method including rotating a magnetron about the back of a target in the chamber, the magnetron having an area of no more than about $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, a magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole; applying power to the target to thereby sputter material from the target onto the substrate at a first rate; applying RF power to the pedestal to provide a plasma to resputter deposition material on the substrate; and confining the plasma using a magnetic field generated by electromagnetic coils disposed around the periphery of the pedestal.

Claim 24 is allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including supplying a precursor gas into the chamber; applying RF power to the pedestal to capacitively couple RF energy into a plasma to ionize the precursor gas and to bias the substrate to attract ionized gas to resputter target material from the bottom of the holes of the substrate and generating a magnetic field to surround the pedestal and confine the plasma to increase the density of the plasma.

Claims 25-45 are allowable over the prior art of record because the prior art of record does not teach the claimed apparatus including a magnetron disposed adjacent

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the target and having an area of no more than about $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, the magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole; an electromagnetic coil carried by the first shield and surrounding the shield; and a controller adapted to control the second power source to sputter the target in a first interval at a first power level and to reduce the power level to a second level in a second interval wherein target material is sputtered on the substrate primarily in the first interval, the controller being further adapted to control the first power source to provide RF power to the pedestal to bias a substrate on the pedestal and to capacitively couple RF power to maintain a plasma in the chamber in the second interval wherein target material deposited on the substrate in the first interval is resputtered from the substrate in the second interval, and the controller being further adapted to control the third power source to provide a magnetic field to surround the pedestal and confine the plasma to increase the density of the plasma in the second interval.

With regard to the method claims the closest prior art (i.e. U.S. Pat. 6,610,184) fails to teach utilizing a rotating magnetron having an area of no more than about $\frac{1}{4}$ of the area of the target, applying RF power to the pedestal to provide a plasma to resputter deposition material on the substrate; and confining the plasma using a magnetic field generated by electromagnetic coils disposed around the periphery of the pedestal nor does the closest prior teach supplying a precursor gas into the chamber, applying RF power to the pedestal to capacitively couple RF energy into a plasma to

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ionize the precursor gas and to bias the substrate to attract ionized gas to resputter target material from the bottom of the holes of the substrate; and generating a magnetic field to surround the pedestal and confine the plasma to increase the density of the plasma.

With regard to the apparatus claims the closest prior art fails to teach the controller feature of the claims including the interaction of the controller with the structural elements of the claims (i.e. power control to control process functions of the apparatus).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rodney G. McDonald
Primary Examiner
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RM
April 10, 2007